Name_____

Differentiation - Power, Constant, and Sum Rules

Date_____ Period_____

Differentiate each function with respect to x.

1) $y = 5$

2) $f(x) = 5x^{18}$

3) $y = 4x^5 + x$

4) $f(x) = 4x^4 - 5x - 3$

5) $y = 3x^{\frac{5}{4}}$

6) $y = \frac{5}{4}x^{\frac{2}{3}}$

7) $y = -4x^{-5}$

8) $y = \frac{3}{x^3}$

9) $y = x^{\frac{2}{3}}$

10) $f(x) = -2\sqrt[4]{x}$

11) $y = \dfrac{2}{3}x^4 + 5x - x^{-3}$

12) $y = -\dfrac{1}{2}x^4 + 3x^{\frac{5}{3}} + 2x$

Differentiate each function with respect to the given variable.

13) $y = -3r^5 - 5r^2$

14) $f(s) = -\dfrac{3}{s^2} - \dfrac{4}{s^4}$

15) $f(x) = \dfrac{2}{3}x^{\frac{3}{2}} - \dfrac{3}{4}x^{\frac{3}{5}}$

16) $h(s) = \sqrt{2} \cdot \sqrt[3]{s} + \sqrt{2} \cdot \sqrt[5]{s}$

Differentiate each function with respect to x. Problems may contain constants a, b, and c.

17) $y = 5c$

18) $y = 4ax^{3a} - bx^{3c}$

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Name_____

Differentiation - Product Rule

Date_____ Period_____

Differentiate each function with respect to x.

1) $y = -x^3(3x^4 - 2)$

2) $f(x) = x^2(-3x^2 - 2)$

3) $y = (-2x^4 - 3)(-2x^2 + 1)$

4) $f(x) = (2x^4 - 3)(x^2 + 1)$

5) $f(x) = (5x^5 + 5)(-2x^5 - 3)$

6) $f(x) = (-3 + x^{-3})(-4x^3 + 3)$

7) $y = (-2x^4 + 5x^2 + 4)(-3x^2 + 2)$

8) $y = (x^4 + 3)(-4x^5 + 5x^4 + 5)$

9) $y = (5x^4 - 3x^2 - 1)(-5x^2 + 3)$

(10) $f(x) = (-10x^2 - 7\sqrt[5]{x^2} + 9)(2x^3 + 4)$

11) $y = (5 + 3x^{-2})(4x^5 + 6x^3 + 10)$

12) $y = (-6x^4 + 2 + 6x^{-4})(6x^4 + 7)$

13) $f(x) = (-7x^4 + 10x^{\frac{2}{5}} + 8)(x^2 + 10)$

Critical thinking question:

14) A classmate claims that $(f \cdot g)' = f' \cdot g'$ for any functions f and g. Show an example that proves your classmate wrong.

Name_____

Differentiation - Quotient Rule

Date_____ Period_____

Differentiate each function with respect to x.

1) $y = \dfrac{2}{2x^4 - 5}$

2) $f(x) = \dfrac{2}{x^5 - 5}$

3) $f(x) = \dfrac{5}{4x^3 + 4}$

4) $y = \dfrac{4x^3 - 3x^2}{4x^5 - 4}$

5) $y = \dfrac{3x^4 + 2}{3x^3 - 2}$

6) $y = \dfrac{4x^5 + 2x^2}{3x^4 + 5}$

7) $y = \dfrac{4x^5 + x^2 + 4}{5x^2 - 2}$

8) $y = \dfrac{3x^4 + 5x^3 - 5}{2x^4 - 4}$

(5)

9) $y = \dfrac{x^3 - x^2 - 3}{x^5 + 3}$

10) $y = \dfrac{x^4 + 6}{3 - 4x^{-4}}$

11) $y = \dfrac{4x^4 - 4x^2 + 5}{2x^{\frac{5}{3}} + 3}$

Critical thinking question:

12) A classmate claims that $\left(\dfrac{f}{g}\right)' = \dfrac{f'}{g'}$ for any functions f and g. Show an example that proves your classmate wrong.

Name_____

Higher Order Derivatives

Date_____   Period_____

For each problem, find the indicated derivative with respect to x.

1) $y = -x^2$ Find $\dfrac{d^2y}{dx^2}$

2) $f(x) = 4x^3$ Find f''

3) $y = -4x$ Find $\dfrac{d^3y}{dx^3}$

4) $f(x) = 5x^4$ Find f'''

5) $y = -5x^4$ Find $\dfrac{d^4y}{dx^4}$

6) $y = 3x^5 - 2x$ Find $\dfrac{d^3y}{dx^3}$

7) $y = -2x^3 - 4x^{-3}$ Find $\dfrac{d^3y}{dx^3}$

8) $y = -x^2 + 2\sqrt[5]{x^2}$ Find $\dfrac{d^3y}{dx^3}$

Critical thinking questions. Find the indicated derivatives with respect to x.

9) $y = 99x^{99}$ Find $\dfrac{d^{100}y}{dx^{100}}$

10) $f(x) = x^{99}$ Find $f^{(99)}$

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